Anti-Doping Awareness in Sports

Prof. Ankush Gupta, Prof. Jay Singh, Prof. Anup Krishnan (Retd),

Prof. Dobson Dominic

Department of Humanities and Social Sciences

IIT Madras

Lecture -36

Dietary Supplements

Good morning, ladies and gentlemen. Welcome back to week eight of this course on anti-doping awareness for sports. I am Colonel Dr. Anup Krishnan, and today we will be speaking about dietary supplements in lecture 1. In week 8, we will be covering some important topics which pertain to doping and anti-doping. One of them is supplements in sport, and the second part will be Anti-Doping Act, the National Anti-Doping Act of India, that will be covered in two parts.

I will be covering this topic as per the following outline: definition, history, we will talk something about sports nutrition, I will speak about common supplements which are used in sports, benefits of supplements, diet calculations, risks of supplements, some legal considerations involved with supplement use, evidence-based recommendations for supplement use, and will conclude with a pyramid, the sports supplement pyramid. So dietary supplements are something added to the diet, mainly vitamins, minerals, amino acids, herbs or botanicals, and metabolites, constituents, extracts, or a combination of any of these ingredients. This is for normal people. Supplements are a combination of concentrated nutrients taken in adequate and prescribed quantities at specific timings, which would complement the training efforts in addition to actual food. This is the definition for sports people.

A little bit of history: in 300 BC, Greek Olympians used specific mushrooms to enhance performance. In the 1800s, Dutch swimmers used caffeine before races, and Belgian swimmers dipped sugar cubes in ether before racing. So basically, the quest for improving performance by using ergogenic aids and supplements is not a new thing. It has been there since a long time, but there are a lot of issues with this, and that we will discuss.

So how did sports nutrition evolve? Sports nutrition evolved in the 1960s by four physicians at the University of Florida who developed a supplement to help the football team. Initially, it was met with skepticism that taking in sugar and salt could be

beneficial, but the performance benefits were immense, and it caught on really fast. In the late 1980s, some colleges, universities, and professional teams began hiring and consulting with dietitians. And soon, well-known athletes started crediting nutrition with their success. The product which was developed in the 1960s was named Gatorade because it was developed at the University of Florida, and the Gators are the University of Florida's American football team.

Alright, so let's talk about the studies, and what do they show. A large proportion of athletes, than the general population in the US, takes dietary supplements. Elite athletes are more often using dietary supplements, more often than their non-elite counterparts. The supplements used by male and female athletes are generally similar, except that a larger proportion of women use iron, and a larger proportion of men take vitamin E, protein, and creatine.

So why is supplementation so important for sports performance? Or why is good nutrition so important for sports performance? If you have a good diet, you can train harder and longer. If you train harder and longer, you put greater overload on the body. If there is greater overload on the body, there is enhanced adaptation in the body. And if there is enhanced adaptation, the athlete becomes fitter. So this is the general principle of sports training, and nutrition helps in this.

Let's talk about some of the benefits of dietary supplements: improves performance by enhancing energy, strength, and endurance; promotes faster recovery by reducing the muscle damage and reducing the inflammation; prevents injuries by improving bone and muscle strength; and supports nutritional gaps by providing essential vitamins and minerals. Right. So we talked about supplements. We talked about why it is important in sports nutrition.

Now let's talk about something called diet calculation, because without diet calculation, you cannot prescribe anything. You cannot prescribe a proper diet. You cannot prescribe a proper supplement. So diet calculation scientifically is based on energy expenditure. There are several factors which are involved, such as the type of sport, training and competition schedule, sex, age, climate, and location. So all of these factors impact the energy expenditure, and therefore it will impact your diet calculation.

Alright, so this is a chart which shows energy expenditure. Now, if you look at the daily activities, there are different types of daily activities such as sleep, occupational activity, non-occupational activity, mean PAL, and total energy expenditure. Now they are assuming a body weight of 70 kilos with a BMR of 1880 kilocalories. Duration of sleep, occupational activity, and non-occupational activity is taken as 8 hours each.

Now there are two different methods of calculating energy expenditure. One is the PAL-PAR method (physical activity level, physical activity ratio method), and they are different for light activity, moderate activity, and heavy activity. Since it is a sports person, we are taking heavy activity. Now, if you look at the diet calculation by PAL, PAR values, it comes to 5525 kilocalories. Now, if you look at it by kilocalories per hour per kg, it comes to 6278 kilocalories. Now, the kilocalorie per hour per kg is considered to be the more accurate measure of energy expenditure. So now, an athlete who weighs 70 kilos will require daily around 6278 kilocalories if he is doing heavy training. So this is how the diet calculation is generally done.

Now, let's come to the protein content of various foods. If you look at the first egg, one egg has six to seven grams of protein. And roughly one cup of milk, eight to ten. Quarter cup of cottage cheese, 7 grams. One ounce of chicken, fish, pork, or beef, 7 grams. So, if he is a 60 kg strength athlete and he requires 1.8 to 2 grams per kg per day protein, look at the protein requirements for this athlete. It comes to almost 120 grams per day. Now, if you eat one egg, you get 7 grams. How many eggs will you have to eat to reach 120 grams per day? How much chicken, fish, pork, or beef will he have to eat? So this is where scientific prescription of supplements will help to make up for the deficiency in nutrition, because it's not possible for somebody to eat 10 or 12 eggs every day.

So why are supplements used in sportspersons? They provide energy for various energy systems; improve muscle tissue growth; increase the bone mineral density and strength; prevent muscle tissue damage; enhance the physiological functions; facilitate recovery following exercise; increase the mechanical efficiency; enhance energy-producing metabolic pathways; regulate the body temperature, this is done by the fluids; increase oxygen transport and delivery. Supplements are a concentrated source of nutrients, and they are useful during travel and competitions. Because during travel and competitions, it's very difficult to find good quality food which is tasty to the palate. Because when you are traveling abroad, it's difficult to find Indian food or local food. So it is always better to carry some supplements with you so that your nutrition requirements are met.

These are some of the common supplements which are used in sports. Protein supplements are used for muscle repair and growth. Creatine is used for increasing the strength and high-intensity performance. Caffeine enhances endurance and improves alertness. Branched-chain amino acids reduce muscle soreness. And electrolytes and fluids help in rehydration.

There are different types of supplements which can be used, such as carbohydrate shakes and bars, protein shakes and bars, sports drinks, energy drinks, vitamin supplements, iron and calcium supplements, and different other types of ergogenic aids. There is a risk associated with over-supplementation or supplement misuse. Athletes tend to over-rely

on the supplements, which will lead to imbalanced diets. We always recommend that the athlete try natural food first, and if there are any nutritional deficiencies after natural food, that has to be made up by supplementation.

It is a supplement to natural food, not a supplement versus natural food. There are several side effects if you take high doses of supplements, especially to the renal system, the gastrointestinal system, the cardiovascular system, the central nervous system, and blood. If the products you are using are contaminated, there is a risk of banned substances entering your body and you developing ADRV (doping risk). There are some supplements which may contain illegal performance-enhancing drugs, and if it is found in your body, an ADRV will be reported.

There are several legal considerations of using supplements in sport. The World Anti-Doping Agency has a list of banned substances which are not supposed to be taken by sportspersons, and that is why a lot of supplements will come under WADA regulations.

Labeling issues; very common. Supplements may not always disclose all the ingredients which are present in the bottle, and the label may be misleading. Athlete responsibility; it is the responsibility of the athlete to know the rules and regulations of sports organizations and the WADA code. And if the athlete is found to be taking some supplement and there is an adverse analytical finding reported on his blood or urine sample, an ADRV will be initiated against him or her.

Natural vs. Synthetic Supplements: what are these natural supplements? They are derived from whole foods. They are usually safer, but they are less concentrated. Synthetic supplements are chemically produced. They have a higher concentration but have more risks. It is always better to consult with a healthcare professional and to choose the right type of supplement. Please note: supplements have to be prescribed, and supplements should not be self-administered.

Let us talk about some supplements depending upon the level of evidence. So what is the evidence-based ranking of supplements? Strong evidence: creatine, strong evidence for high-intensity performance, for development of strength and development of muscle mass; caffeine, strong evidence for enhancing endurance and improving alertness. Supplements with moderate evidence: protein supplements, they support muscle recovery and growth; beta-alanine, delays fatigue and heartburn; branched-chain amino acids, they say it may reduce muscle soreness, and there is moderate evidence of this. Emerging or limited evidence: nitrate or beetroot juice is said to enhance the endurance; electrolytes- support hydration and prevent muscle cramps. Minimal or no evidence: glutamine, antioxidants, and HMP- there is mixed or weak evidence for performance enhancement of these supplements.

So let us sum up what we have learned in this lecture. When you talk about prescribing a diet for an athlete, you should always talk about natural food first. So more substances from the base of the pyramid should be used. Then we talk about the type of the food; that is protein, fat, and carbohydrate. Then we talk about the timings, because timing or periodization of nutrition is very important. A training diet is different from a competition diet. A pre-competition diet is different from a post-competition diet. And a recovery diet will be completely different. Basically, what matters is how you tweak the protein, fat, carbohydrate, fluids, and nutrients, electrolytes in the diet with respect to the training loads and the competition loads of the athlete. Once you have reached the periodization state of supplements of nutrients, then if there is any nutritional deficiency or deficiency in the energy expenditure versus the diet being provided, then we talk about supplementation. And this is how you are supposed to prescribe a diet for an athlete. Right. So natural food first; variation in the type and the quantity of protein, fat, carbohydrates; timing of each of the nutrients including electrolytes, water, etc.; and last, supplements.

These are my references, ladies and gentlemen. I strongly urge you to go through them in case you wish to know further about the subject. Basically, supplements and sport is a vast subject. And for an introductory course like this, I can only touch upon the important aspects. But it is a whole science and a whole textbook, multiple textbooks in itself. So in case you are interested, you can go through any of the standard textbooks for this subject. I seem to have finished, ladies and gentlemen. Thank you for beginning week 8, and thank you for your patient listening. Thank you, and Jai Hind.